Citation 3

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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04N 7/24	A1	(11) International Publication Number: WO 00/65839 (43) International Publication Date: 2 November 2000 (02.11.00)

(21) International Application Number: PCT/KR00/00248

(22) International Filing Date: 22 March 2000 (22.03.00)

(30) Priority Data:
60/130,643 23 April 1999 (23.04.99) US

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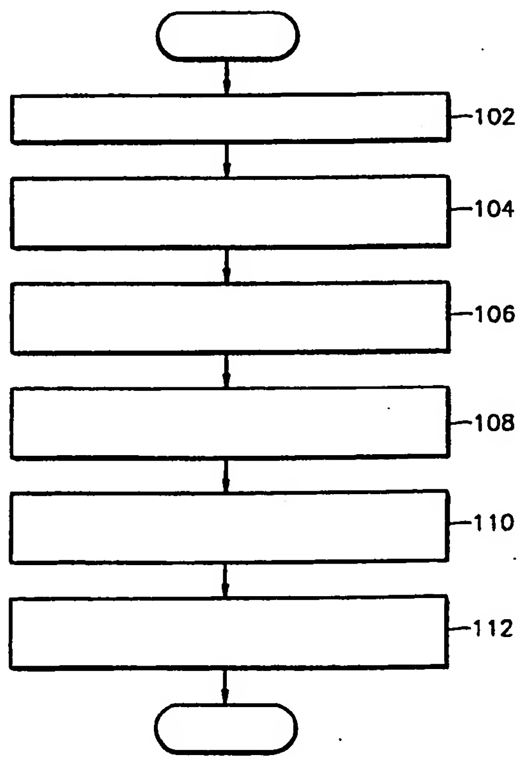
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
In English translation (filed in Korean).

(54) Title: COLOR IMAGE SEGMENTATION METHOD

(57) Abstract

A color image segmentation method is provided. The color image segmentation method includes the steps of: (a) calculating a predetermined value representing the degree of difference form the color of peripheral pixels by using pixel values of an input image; (b) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and (c) segmenting the converted image. According to the color image segmentation method, a robust and an automatic segmentation is possible, and a segmentation speed is high even when segmenting an image containing much noise.



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COLOR IMAGE SEGMENTATION METHOD

Technical Field

The present invention relates to a color image segmentation method, and more particularly, to a color image segmentation method for segmenting a color image.

Background Art

The segmentation of a color image is a very important part of digital image processing and its applications. Conventional color image segmentation methods have a problem in that it is not easy to segment a color image containing texture. Also, another conventional color image segmentation method for performing an automatic segmentation is not robust with respect to an input image containing noise, and still another conventional color image segmentation method for again segmenting the image which a user segments preparatorily is robust with respect to an input image containing noise, but an automatic segmentation is not performed, therefore, it takes much time.

Disclosure of the Invention

To solve the above problems, it is an object of the present invention to provide a color image segmentation method capable of automatically segmenting a color image containing texture and being robust with respect to an input image containing noise.

It is another object of the present invention is to provide a color image processing method containing the color image segmentation method.

It is still another object of the present invention is to provide a medium in which a computer program performing the color image segmentation method is stored.

Accordingly, to achieve the above object, according to one aspect of the present invention, there is provided a color image segmentation method.

The color image segmentation method comprises the steps of: (a) calculating a predetermined value representing the degree of difference from the color of peripheral pixels by using pixel values of an input image; (b) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and (c) segmenting the converted image.

Preferably, the step (c) segments the converted image based on a region growing method.

It is preferable that the color image segmentation method, prior to the step (a), further comprises the step of (p-a) quantizing pixel values of an image into a predetermined number of representative pixel values; wherein the pixel values are quantized pixel values.

The representative pixel values preferably consist of 10-20 values.

It is preferable that the color image segmentation method, prior to the step (a), further comprises the steps of: (p-a-1) defining a predetermined window containing a center pixel; and (p-a-2) calculating a predetermined value representing the degree of difference from the color of peripheral pixels with respect to pixels in a defined window.

It is also preferable that the step (a) comprises the steps of: (a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and (a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and (a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

d is preferably an integer inclusive of and between 3 and 10.

The predetermined scale is preferably a gray scale having values between 0 and 255.

In order to achieve the above object, according to another aspect of the present invention, there is provided a color image segmentation method. The color image segmentation method comprises the steps of: (a) quantizing pixel values of an image into a predetermined number of representative pixel values; (b) calculating a predetermined value representing the degree of difference from the color of pixels in a predetermined size window using quantized representative pixel values; (c) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and (d) segmenting the converted image using a segmentation method based on a region growing method.

In order to achieve another object, there is provided an object-based color image processing method for processing a color image according to a color image segmentation method. The color image segmentation method comprises the steps of: (a) calculating a predetermined value representing the degree of difference from the color of peripheral pixels using pixel values of an input image; (b) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and (c) segmenting the converted image.

In order to achieve still another object, there is provided a medium for storing program codes performing a color image segmentation method for segmenting a color image into a plurality of regions. The color image segmentation method comprises the steps of: (a) quantizing pixel values of an image into a predetermined number of representative pixel values; (b) calculating a predetermined value representing the degree of difference from the color of pixels in a predetermined size window using quantized representative pixel values; (c) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and (d) segmenting the converted image using a segmentation method based on a region growing method.

Brief Description of the Drawings

The above objects and advantages of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings in which:

FIG. 1 is a flowchart illustrating a color image segmentation method according to a preferred embodiment of the present invention;

FIGS. 2A through 2C illustrate class-maps and J-values formed according to a color image segmentation method of FIG. 1;

FIGS. 3A and 3B illustrate segmented class-maps;

FIG. 4A illustrates one image frame of a "container" as a test image and a test image segmented by the color image segmentation method according to the present invention;

FIG. 4B illustrates one image frame of a "foreman" as a test image and a test image segmented by the color image segmentation method according to the present invention;

FIG. 4C illustrates one image frame of a "coast" as a test image and a test image segmented by the color image segmentation method according to the present invention;

FIG. 4D illustrates one image frame of a "flower garden" as a test image and a test image segmented by the color image segmentation method according to the present invention; and

FIG. 4E illustrates one image frame of a "mother and daughter" as a test image and a test image segmented by the color image segmentation method according to the present invention.

Best mode for carrying out the Invention

Referring to FIG. 1, which illustrates a flowchart illustrating a color image segmentation method according to a preferred embodiment of the present invention, a color image is input (step 102), and pixel values of an input image are quantized into several representative pixel values (step 104). In order to classify an image in natural scenes, the representative pixel values

consist of 10-20 values. In this embodiment, quantization is performed using three representative pixel values for convenience of explanation. Next, a class-map is formed by assigning labels corresponding to a quantized representative pixel values (step 106).

More preferably, a window centered at a pixel to be processed in an entire image is defined. That is, when d is a positive integer, preferably between 3 and 10, a window B which is centered at a pixel p and has a size of d x d, is defined. Also, an assumption is made that i is the number between 1 and C, and Z_i is a set of all the pixels in the window B. In other words, an assumption is made that Z_i is classified into a C number of classes. Preferably, the d determining the size of the window is an integer inclusive of and between 3 and 10.

Also, an assumption is made that m_i is the average of positions of N_i data points in class Z_i as:

(equation 1)

$$m_i = \frac{1}{N_i} \sum_{z \in Zi} z$$

Also, S_T and S_W are defined by:

(equation 2)

$$S_T = \sum_{z \in Z} \|z - m\|^2 \text{ and}$$

(equation 3)

$$S_W = \sum_{i=1}^{C} Si = \sum_{z \in Z_i} \|z - m_i\|^2$$

respectively.

Next, a J-value with respect to each pixel in a class-map is obtained (step 108). The J-value with respect to each pixel in the class-map is defined as follows:

(equation 4)

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

The J-values obtained by equation 3 are converted into a gray scale value between 0 and 255, so that a gray scale image having values and capable of being referred to as a J-image is obtained (step 110). The J-image has the same form as a three-dimensional topographic map containing valleys and mountains that actually represent region centers and region boundaries, respectively.

Lastly, the J-image is segmented based on a region growing method (step 112). The region growing method is known to one of ordinary skill in the art as a method used for the segmentation of a digital image, therefore, an explanation thereof is not given.

FIGS. 2A through 2C illustrate class-maps and J-values formed according to a color image segmentation method of FIG. 1. The J-value at the center pixel is 1.720 in the class-map of FIG. 2A, and in the class-map of FIG. 2B, the J-value at the center pixel is 0, and in the class-map of FIG. 2C, the J-value at the center pixel is obtained as 0.855. Here, like in the class-map of FIG. 2A, in the case where pixels represented as + located at the left of the center pixel, pixels represented as 0 located at the right of the center pixel, and pixels represented as * located at the right of the center pixel form regions most clearly, the J-value is 1.720, a relative large value. Also, like in the class-map of FIG. 2B, in the case where the pixels represented as +, the pixels represented as 0, and the pixels represented as * are uniformly distributed and hardly form regions, the J-value is 0. Furthermore, like in the class-map of FIG. 2C, in the case where the pixels represented as * located at the right of the center pixel form regions, but the pixels represented as 0 and * hardly form regions, the J-value is 0.855. That is, the larger the J-value is, the more likely that the pixel is near to a region boundary, therefore, a segmentation based on the region growing method by using this point can be performed.

FIGS. 3A and 3B illustrate segmented class-maps.

It is necessary to check whether a segmentation is performed well with respect to each region in the segmented class-maps and to represent the same as quantized values. For this purpose, when J_k is the J-value obtained with respect to a k-region, and M_k is the number of pixel points of a k-th region, and N is the total number of pixel points in the class-map, the averaged J-value is calculated as:

(equation 5)

$$\bar{J} = \frac{1}{N}\sum_k M_k J_k$$

The calculated values are represented as quantized values whether a segmentation is performed well with respect to each region in the segmented class-maps or not.

In the case of the segmented class-map shown in FIG. 3A, J is 0, on the other hand, in the case of the segmented class-map shown in FIG. 3B, J is 0.05. That is, in the case of regions of a fixed number, especially in the case of better segmentation, the averaged J-value is small. This occurs because the region contains a few uniformly distributed color classes in the case where a region is well segmented. Accordingly, the averaged J-value is small.

FIG. 4A illustrates one image frame of a "container" as a test image and a test image segmented by the color image segmentation method according to the present invention. Referring to FIG. 4A, $\bar{J}$ of an image before segmentation is 0.232, but, $\bar{J}$ of the image after segmentation is 0.071. Also, it is evident that regions in the test image are well segmented.

FIG. 4B illustrates one image frame of a "foreman" as a test image and a test image segmented by the color image segmentation method according to the present invention. Referring to FIG. 4B, $\bar{J}$ of an image before segmentation is 0.238, but $\bar{J}$ of the image after segmentation is 0.105. Also, it is evident that regions in the test image are well segmented.

FIG. 4C illustrates one image frame of a "coast" as a test image and a test image segmented by the color image segmentation method according to the present invention. Referring to FIG. 4C, $\bar{J}$ of an image before segmentation is 0.494, but $\bar{J}$ of the image after segmentation is 0.093. Also, it is evident that regions in the test image are well segmented.

FIG. 4D illustrates one image frame of a "flower garden" as a test image and a test image segmented by the color image segmentation method according to the present invention. Referring to FIG. 4D, $\bar{J}$ of an image before segmentation is 0.435, but $\bar{J}$ of the image after segmentation is 0.088. Also, it is evident that regions in the test image are well segmented.

FIG. 4E illustrates one image frame of a "mother and daughter" as a test image and a test image segmented by the color image segmentation method according to the present invention. Referring to FIG. 4E, $\bar{J}$ of an image before segmentation is 0.438, but $\bar{J}$ of the image after segmentation is 0.061. Also, it is evident that regions in the test image are well segmented.

That is, as described referring to FIG. 4A through 4E, $\bar{J}$ of the image segmented by the color image segmentation method according to the present invention is smaller than $\bar{J}$ of the image before segmentation.

In the above embodiment, the calculation of a specific function is explained as an example, however, this is only for explanation. The scope of the present invention defined in the appended claims is not limited to the embodiment, and it is obvious that one of ordinary skill in the art can use another modified function representing the degree of difference from the color of peripheral pixels.

Furthermore, the above color image segmentation method can be embodied in a computer program. Codes and code segments composing the program can be easily inferred to by a skilled computer programmer in the art. Also, the program can be stored in computer readable media, read and executed by a computer, and it can thereby realize the color image processing

method. The media can include magnetic media, optical media, and carrier waves.

As described above, according to the present invention, a color image can be automatically segmented without user's assistance and is robust with respect to an input image containing noise.

Industrial Applicability

In the above color image segmentation method according to the present invention, a robust segmentation is possible even when segmenting an image containing much noise or texture. Furthermore, an automatic segmentation is possible without user's assistance such as segmentation performed manually by a user, therefore, the segmentation speed is high. The color image segmentation method can be applied to object-based image processing such as that used in MPEG-7.

What is claimed is:

1. A color image segmentation method for segmenting a color image into a plurality of regions, comprising the steps of :

(a) calculating a predetermined value representing the degree of difference from the color of peripheral pixels by using pixel values of an input image;

(b) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and

(c) segmenting the converted image.

2. The color image segmentation method according to claim 1, wherein the step (c) segments the converted image based on a region growing method.

3. The color image segmentation method according to at least one of claim 1 or claim 2, prior to the step (a), further comprising the step of (p-a) quantizing pixel values of an image into a predetermined number of representative pixel values; wherein the pixel values are quantized pixel values.

4. The color image segmentation method according to claim 3, wherein the representative pixel values consist of 10-20 values.

5. The color image segmentation method according to at least one of claim 1 or claim 2 or claim 4, prior to the step (a), further comprising the steps of:

(p-a-1) defining a predetermined window containing a center pixel; and

(p-a-2) calculating a predetermined value representing the degree of difference from the color of peripheral pixels with respect to pixels in a defined window.

6. The color image segmentation method according to claim 3, prior to the step (a), further comprising the steps of:

(p-a-1) defining a predetermined window containing a center pixel; and

(p-a-2) calculating a predetermined value representing the degree of difference from the color of peripheral pixels with respect to pixels in a defined window.

7. The color image segmentation method according to at least one of claim 1 or claim 2, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

8. The color image segmentation method according to claim 3, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

9. The color image segmentation method according to claim 4, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all the pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

10. The color image segmentation method according to claim 5, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

11. The color image segmentation method according to claim 6, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i number of data points of class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

12. The color image segmentation method according to claim 7, wherein the d is an integer inclusive of and between 3 and 10.

13. The color image segmentation method according to claim 8, wherein the d is an integer inclusive of and between 3 and 10.

14. The color image segmentation method according to claim 9, wherein the d is an integer inclusive of and between 3 and 10.

15. The color image segmentation method according to claim 10,

wherein the d is an integer inclusive of and between 3 and 10.

16. The color image segmentation method according to claim 11, wherein the d is an integer inclusive of and between 3 and 10.

17. The color image segmentation method according to at least one of claim 1 or claim 2, wherein the predetermined scale is a gray scale having values between 0 and 255.

18. The color image segmentation method according to claim 3, wherein the predetermined scale is a gray scale having values between 0 and 255.

19. The color image segmentation method according to claim 4, wherein the predetermined scale is a gray scale having values between 0 and 255.

20. The color image segmentation method according to claim 5, wherein the predetermined scale is a gray scale having values between 0 and 255.

21. The color image segmentation method according to claim 6, wherein the predetermined scale is a gray scale having values between 0 and 255.

22. The color image segmentation method according to claim 7, wherein the predetermined scale is a gray scale having values between 0 and 255.

23. The color image segmentation method according to claim 8, wherein the predetermined scale is a gray scale having values between 0 and

255.

24. The color image segmentation method according to claim 9, wherein the predetermined scale is a gray scale having values between 0 and 255.

25. The color image segmentation method according to claim 10, wherein the predetermined scale is a gray scale having values between 0 and 255.

26. The color image segmentation method according to claim 11, wherein the predetermined scale is a gray scale having values between 0 and 255.

27. The color image segmentation method according to claim 12, wherein the predetermined scale is a gray scale having values between 0 and 255.

28. The color image segmentation method according to claim 13, wherein the predetermined scale is a gray scale having values between 0 and 255.

29. The color image segmentation method according to claim 14, wherein the predetermined scale is a gray scale having values between 0 and 255.

30. The color image segmentation method according to claim 15, wherein the predetermined scale is a gray scale having values between 0 and 255.

31. The color image segmentation method according to claim 16, wherein the predetermined scale is a gray scale having values between 0 and

255.

32. An object-based color image processing method for processing a color image according to a color image segmentation method, wherein the color image segmentation method comprises the steps of:

(a) calculating a predetermined value representing the degree of difference from the color of peripheral pixels using pixel values of an input image;

(b) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and

(c) segmenting the converted image.

33. The color image processing method according to claim 32, wherein the color image processing method complies with the MPEG-7 standard.

34. A color image segmentation method for segmenting a color image into a plurality of regions, comprising the steps of:

(a) quantizing pixel values of an image into a predetermined number of representative pixel values;

(b) calculating a predetermined value representing the degree of difference from the color of pixels in a predetermined size window using quantized representative pixel values;

(c) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and

(d) segmenting the converted image using a segmentation method based on a region growing method.

35. The color image segmentation method according to claim 34, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size

of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$.

36. The color image segmentation method according to claim 35, wherein d is an integer inclusive of between 3 and 10.

37. The color image segmentation method according to one of claim 34 to claim 36, wherein the predetermined scale is a gray scale having values between 0 and 255.

38. A medium for storing program codes performing a color image segmentation method for segmenting a color image into a plurality of regions, wherein the color image segmentation method comprises the steps of:

(a) quantizing pixel values of an image into a predetermined number of representative pixel values;

(b) calculating a predetermined value representing the degree of difference from the color of pixels in a predetermined size window using quantized representative pixel values;

(c) obtaining a converted image by converting a calculated value into a value of a predetermined scale; and

(d) segmenting the converted image using a segmentation method based on a region growing method.

39. The medium according to claim 38, wherein the step (a) comprises the steps of:

(a-1) defining a window B which is centered at a pixel p and has a size of d x d when d is a positive integer; and

(a-2) classifying a pixel position Z_i into a C number of classes when i is a number between 1 and C, and Z_i is a set of all pixels in the window B; and

(a-3) obtaining a J-value with respect to each pixel in a class-map as:

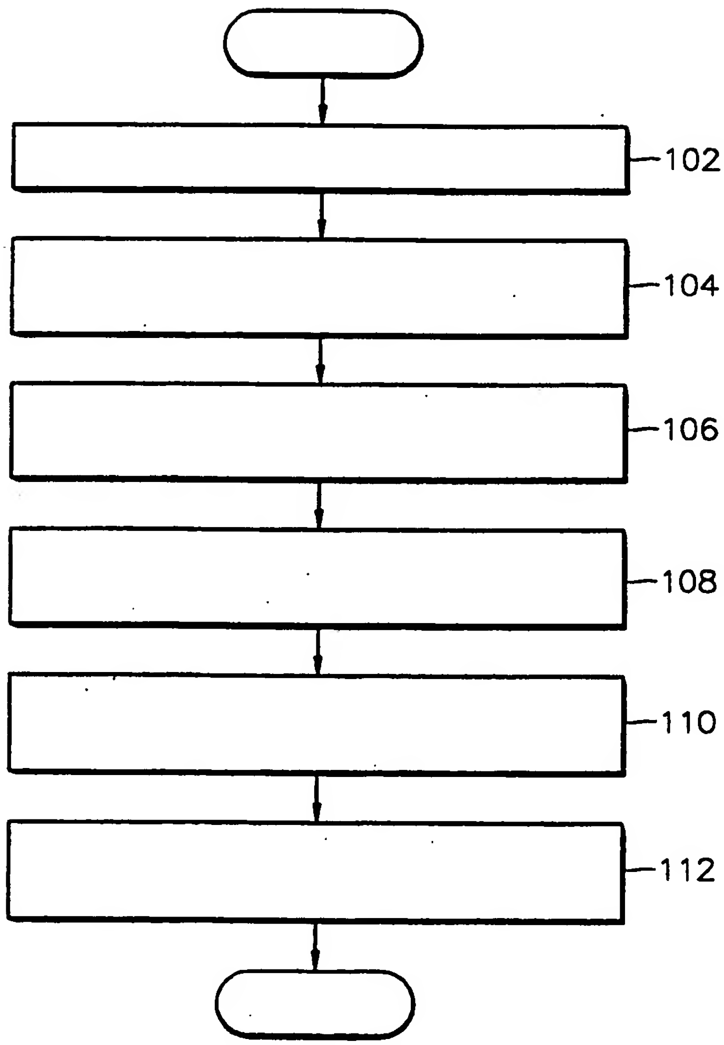
$$J = \frac{S_B}{S_W} = \frac{S_T - S_W}{S_W}$$

where m_i is the average of positions of N_i data points in class Z_i, $S_T = \sum_{z \in Z} \|z - m\|^2$ and $S_W = \sum_{i=1}^{C} S_i = \sum_{z \in Z_i} \|z - m_i\|^2$

40. The medium according to claim 39, wherein d is set as an integer inclusive of and between 3 and 10.

41. The medium according to one of claim 38 to claim 40, wherein the predetermined scale is a gray scale having values between 0 and 255.

도 1



도 2a

```
+ + + + + 0 0 0 0
+ + + + + 0 0 0 0
+ + + + + 0 0 0 0
+ + + + + 0 0 0 0
+ + + + + 0 0 0 0
+ + + + * * * * *
+ + + + * * * * *
+ + + + * * * * *
+ + + + * * * * *
```

클래스 맵 1
J=1.720

도 2b

```
+ * + * + * + * +
0 + 0 + 0 + 0 + 0
+ * + * + * + * +
0 + 0 + 0 + 0 + 0
+ * + * + * + * +
0 + 0 + 0 + 0 + 0
+ * + * + * + * +
0 + 0 + 0 + 0 + 0
+ * + * + * + * +
```

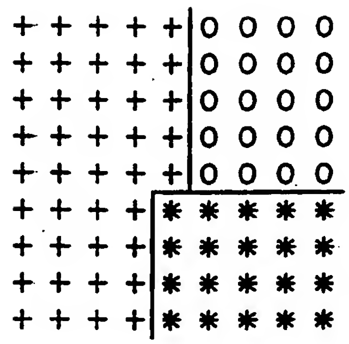
클래스 맵 2
J=0

도 2c

```
+ + + + + * 0 * 0
+ + + + + 0 * 0 *
+ + + + + * 0 * 0
+ + + + + 0 * 0 *
+ + + + + * 0 * 0
+ + + + * 0 * 0 *
+ + + + 0 * 0 * 0
+ + + + * 0 * 0 *
+ + + + 0 * 0 * 0
```

클래스 맵 3
J=0.855

도 3a

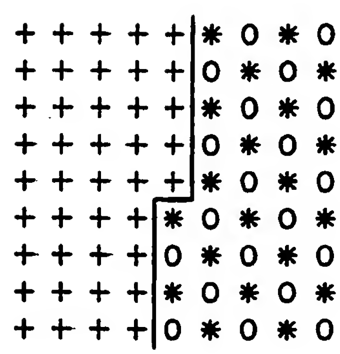


분할된 클래스 맵 1

$J_{+}=0$, $J_{*}=0$, $J_{0}=0$

$\bar{J}=0$

도 3b

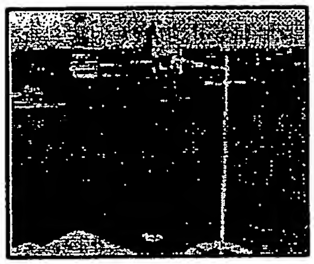


분할된 클래스 맵 3

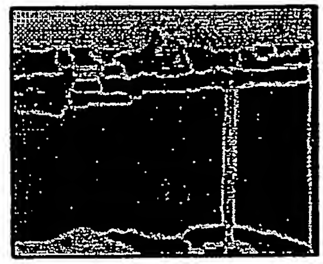
$J_{+}=0$, $J_{(*,0)}=0.011$

$\bar{J}=0.05$

도 4a



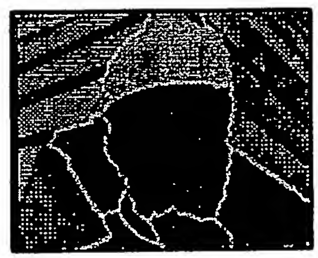
컨테이너(container),
프레임 0
$\bar{J}=0.232$



분할된 영상
$\bar{J}=0.071$

도 4b

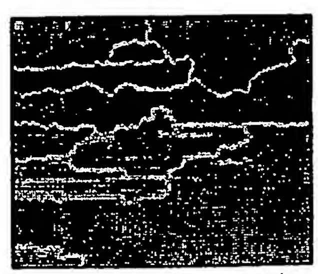
포어맨(foreman),
프레임 4
$\bar{J}=0.238$



분할된 영상
$\bar{J}=0.105$

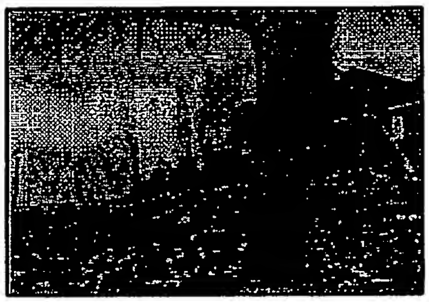
도 4c

코오스트(coast),
프레임 200
$\bar{J}=0.494$

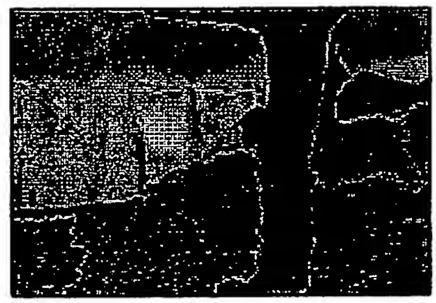


분할된 영상
$\bar{J}=0.093$

도 4d



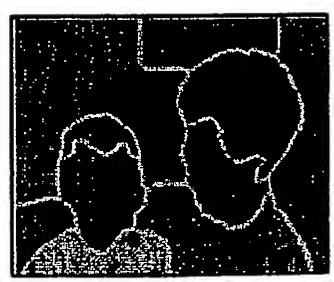
플라워 가든(flower garden),
프레임 0
$\bar{J}$=0.435



분할된 영상
$\bar{J}$=0.088

도 4e

마더 앤 도터
(mother and daughter),
프레임 0
$\bar{J}$=0.438



분할된 영상
$\bar{J}$=0.061

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/00248

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04N 7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)

IPC7 HO4N7/24

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched

Korean Patents and applications for inventions since 1975
Korean Utility models and applications for Utility models since 1975
Japanse Utility models and applications for Utility models since 1975

Electronic data base consulted during the intertnational search (name of data base and, where practicable, search trerms used)

PATROM, USPTO Searck DB, TIMEPASS, NPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR98-24924A(HYUNDAI ELECTRONICS), 6, July, 1998(6. 7. 98), see full text	1, 2, 4, 32-34, 38
E	KR99-82010(THOMSON MULTIMEDIA, 15, November. 99(15. 11. 99), claim 1, 8	1, 32, 38
A, Y	S,Ji and H.W.Park, 'Image Segmentation of Color Image Based On Region Coherency', Image Preocessing.1998, ICIP98.Proceedings. 1998 International Conference on Published 1998, Volume1, Page 80 ~ 83	1, 32, 38

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevence
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevence; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 JULY 2000 (15.07.2000)	19 JULY 2000 (19.07.2000)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR00/00248

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 98-24924	06. 07. 98	KR 96-41959	24. 09. 26
KR 99-82010	15. 11. 99	WO 1998/24062	04. 06. 98

4p